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# A QUANTITATIVE ANALYSIS OF THE ROLE OF SOCIAL NETWORKS IN EDUCATIONAL CONTEXTS

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## ABSTRACT

Recent advances in Information Technology (IT) and the advent of Web 2.0 created the path for education to ascertain its potential from this phenomenon. The role of e-learning has transformed completely as Web 2.0 technologies enabled the creation of learning content that is no longer based on textbooks and learning guides, but on manageable, modular learning components. The emergence of Education 2.0 enabled technology enhanced teaching and learning necessitating new pedagogical approaches while e-learning has evolved into an instrumental pedagogy of collaboration and sharing of resources through affordances of social media. Educational social networks were created as supportive mechanisms for special interest groups. Traditional teaching methods have been replaced with technology-enhanced media that enable ubiquitous learning. Social networks as educational tools have enabled individual and group learning through social engagement and social distribution of knowledge. Studies have demonstrated the role of social media as a complementary educational tool. Many studies have reported that a larger proportion of students spend more time engaging in social online activities than in classroom. However, there is a lack of quantitative study on how social networks such as Facebook can be influential on students' progress and achievement. This paper investigates how a quantitative overview of Facebook's influence on students' progress can be incorporated in a proposed e-moderation model of teaching and learning through Facebook. The proposed e-moderation model (Salmon, 2003) provides an emphasis on the theoretical perspectives that support socially situated learning environment of social networks such as Facebook.

## KEYWORDS

e-learning, social learning networks, education 2.0, social media, Facebook, e-moderation model.

## 1. INTRODUCTION

The popularity of social media and their seemingly instant access to users have had unparalleled influences on different service industries. Academics have benefited from the favourable qualities of social networks in almost all education sectors. Students and instructors have adapted to unique capabilities and complementary affordances of social networks in their studies. Despite the popularity of Facebook as the favourable social network at university or colleges, there is a lack of quantifiable study on its role on student's performance. This is understandable as it is difficult to quantify the impact of a social network in teaching effectiveness, learning progress, or assessment results. There are several factors affecting such activities and it is difficult to prove that any significant changes can be attributed solely on the introduction of social networks in educational settings. Over the past few years, the authors have attempted several pilots with students in a Further Education Institution (FEI) and a Higher Education Institution (HEI) in order to investigate the impact of using social media in specific learning activities as well as the overall effect of introducing a social learning network in the classroom.

Generally, the literature suggests that Social Network Sites (SNSs) are mainly used in education as tools supporting existing social relationships and enabling the maintenance of social capital (Ellison et al, 2011), but their value as a learning environment is still questioned. However, regardless of scholars' views on the topic, Facebook has remained one of the most popular social networks amongst students, teachers and lecturers due to its availability and unique features over the last decade. This networking tool needs much more exploration not only as a LMS, but as a platform for delivery of educational purposes. Its use in education is still short of full investigation due to its privacy limitations. This paper reports on the findings of

a study implementing Facebook as the complementary platform during a pilot involving several FEI and HEI undergraduate students.

For this study, the authors have focused on a well-established e-moderation model (Salmon, 2003). The e-moderation model consists of five stages describing the learning journey of a learner, achieving certain learning stages by following a constructivist approach. The model was based on the principle that learners will proceed through the stages with specific expected participation and interaction along with a given amount of interactivity through the experience. The study presented in this paper introduced the Facebook environment created for both FEI and HEI students in order to establish the transition from one stage to the next through the use of the Facebook features. The five stages of the e-moderation model within the context of the Facebook SNS are as follows:

- Access and motivation
- Online socialisation
- Information exchange
- Knowledge construction
- Development

The authors made a key assumption for the purposes of this study, which was that teaching and learning activities supported through Facebook features could be incorporated using the e-moderation model as proposed by Gilly Salmon (2003).

## 2. LITERATURE REVIEW

The role of SNSs in education has increasingly become the centre of a lot of work in the field (Boyd and Ellison, 2007; Hew, 2011; Junco, 2012). Facebook has been arguably one of the most successful social networks, used across several age groups (Grosseck, Bran, & Tiru, 2011; Roblyer, McDaniel, Webb, Herman, & Witty, 2010). Facebook offers integrated features that facilitate social interaction among users, and these features can be used effectively for the support of various learning activities. Facebook users with common interests can gather and share their goals in small, focused groups. Facebook pages enable the use of incorporated characteristics disseminating social interaction, and foundations of social knowledge construction. Social networks and their built in features have encouraged educational research interest in to the potential applications and the benefits of integrating Facebook in learning activities (Kabilan, Ahmad, & Abidin, 2010; Mazman & Usluel, 2010). The authors have published previously their findings on the role of social media in e-learning enhancement (Shokri and Dafoulas, 2014), the use of social networks in e-education (Dafoulas and Shokri, 2014a), delivering e-learning through social networks (Dafoulas and Shokri, 2014b), and integrating Web 2.0 technologies in learning (Dafoulas and Shokri, 2014c),

The social characteristics of Facebook seem to be ideal for facilitating learners in constructing knowledge through social interaction. Social knowledge construction encourages frequent social interaction and allows peer learning. By incorporating educational activities that facilitate knowledge construction, such as discussion, collaborative learning or project-based learning, students are encouraged to share, discuss and produce diverse concepts during the process of social interaction (Hou & Wu, 2011). Web 2.0 technologies have the potential to initiate the creation of on-line learning communities that can be particularly helpful across communities spread over different geographical regions (Mason and Rennie, 2007). These communities can also enhance engaged learning where participants gather their own knowledge through investigation and search for information on the Internet (Kamel Boulos and Wheeler, 2007). This paper discusses how the authors' efforts are currently shifting towards investigating whether it is possible to quantify the impact of Web 2.0 technologies to learning enhancement.

Social media create value for the online communities as a driver to enrich educational opportunity and enhance the quality of web-based learning. Social media can be used for the transition from content-focused e-learning towards social learning, where individuals have interaction on the Internet and can use multiple sources of data and information for their learning. The key difference between e-learning and social learning is that the latter supports multiple communication channels, leading to several sources of learning content, including the learners themselves. Social media enables the learning to happen unrestricted by physical locations and in all kinds of creative ways such as social interaction and online collaborations (Bingham and Conner, 2010). There are a number of studies that investigated the impacts of social media on e-learning. For

example, it is argued that the future of e-learning will be a shift to knowledge networking and knowledge management (Chatti et al., 2007).

By taking advantage of structural and interactive features, social media provide a virtual environment that allows users to interact with each other, create, share, and exchange information and knowledge (Dickey and William, 2010, Aula, 2010, Kaplan and Haenlein, 2010). Social media users learn from each other by sharing their information, knowledge, and various experiences via such social media tools as twitter, blogs, YouTube, and Facebook. They also receive social support by participating in online activities and interacting with other members. For example, individuals share their knowledge in virtual communities, which is helpful for them to learn from each other and solve problems at both education and work (Hsu et al., 2007).

The traditional limitations of e-learning programs that mainly focused mainly on content delivery and less on frequent student interactions may be overcome by encouraging learners to share personal and professional interests and aspirations usually excluded from e-learning settings. According to Duffy (2011), SNSs offer a set of affordances for the creation of collaborative activities that occur online, mostly because many students are already using them for socialization and communication purposes and they would be willing to use these sites in learning as well; moreover, SNSs are free of charge and come without the restrictions usually found in many institutional Learning Management Systems (LMSs).

According to Greenhow (2011), SNS might be re-envisioned as support for student learning outcomes at least from two perspectives: first, they can provide peer/alumni support to manage the ups and downs of high school or college life, or help with school-related tasks; second, SNS can stimulate social and civic benefits, online and offline. This positive attitude is confirmed by other surveys (Fewkes & McCabe, 2012), the results of which showed that, in opposition to the claim that students do not use Facebook to support the learning agenda of the classroom, there are many in-depth examples of students who are using it for educational purposes. This paper focuses on the role of Facebook as a supporting tool for in-class educational activities as well as educational support in self-study between learning sessions.

A further research study (Mazman & Usluel, 2010) determined that the factors influencing Facebook users' adoption processes in an educational context rely on a positive relationship with usefulness, ease of use, social influence, facilitating conditions and community identity, and that among these variables the usefulness dimension is the most important determinant in Facebook adoption. In other words, learners must be persuaded for the impact the technology has on their learning. This has been one of the major challenges in this study, as apart from the obvious incentives through assessment and feedback, students were provided with guidance of how Facebook features would support their communication with peers and understanding of the topics covered in class.

Students' familiarity with Facebook and the ease at which its features can be applied to establish meaningful interactions, are the reasons for its popularity in particular amongst students. The new millenniums of learners depend on the new means of self-expression that exceed traditional communication technology tools. The new forms of literacy and students new digital needs demand innovative teaching practices without classroom constraints and traditional learning methods. Facebook offers ubiquity and mobility settings that flourishes student's engagement in academic content without strict boundaries of traditional teaching and learning. Features of Facebook that enrich and support interaction and discussion accelerate learner's participation, enabling classroom discussion and information exchange. A study highlighted the efficacy of Facebook as an informal learning tool, in which an optional Facebook activity was used to expose students to issues not covered in the core content of a formal course (Cain & Policastri, 2011). Two further studies found that Facebook has the potential to engage students in meaningful academic conversations depending on the timing as well as the topics of discussion (LaRue, 2012; Lim & Ismail, 2010). A Facebook application relating to learning about environmental issues allowed users to develop environmental behaviour through participation and peer role modelling (Robelia, Greenhow, & Burton, 2011). The use of Facebook for peer assessment and cooperative learning turned out to have a positive influence on the development of English writing skills and knowledge (Shih, 2011). Comparing statistics on the use of Facebook and Blackboard, for instance, in a study, found that students were more likely to post and be exposed to posts on Facebook than on traditional LMS (DiVall & Kirwin, 2012). All these studies seem to work towards quantifying the impact of Facebook on learning activities and overall learning enhancement.

The impact of any SNS is based on its social infusion of their technical capabilities within the population it serves. As Selwyn (2007a) stated, SNS capabilities and interactions are improving learning activities within a highly social environment. Recent studies have also found the adoption of Social Network Sites at all levels of education, as an example with higher education state: University students are very open to the possibility

of using Facebook and similar technologies to support classroom work, (Roblyer et al 2010). In the following pages we will discuss our observations on the impact of Facebook in a number of learning activities and our early attempts to quantify how it affects student performance.

### **3. PILOT STUDIES**

This research is based on a series of pilot studies with FEI and HEI students. Both pilot studies spread across two-three years and involved a range of modules. The aim of the study was to incorporate Facebook in the curriculum by enhancing learning activities through specific features. In particular the scope was to introduce Facebook as the means to communicate between group members, deliver content, provide collaboration across teams and evaluation feedback from peers, and instructors.

#### **3.1 Pilot Methods**

The first pilot series was conducted with the participation of both FEI students studying an advanced level diploma course and HEI undergraduate students. Both pilot series were involving students with IT or computing programmes, with sufficient skills in the relevant technologies. The study involved four groups of IT students during two pilot studies lasted between one to six weeks. Each seminar group consisted of 20 students with approximately 80 students taking part in the FEI pilots in three IT related modules including 4GL Programming, HCI, and advanced level Spreadsheet Design. Data was gathered in class through online activities designed and delivered through Facebook over the period of five weeks in the second semester. Each group completed module related activities with the combination of teaching concepts, exercises and formative assessment of their learning. Facebook pages were designed and created to correspond to the module delivery with focus on enabling learners understanding of topics, providing learning summaries and obtaining learners' opinions on the online task at hand. These pages were designed to reinforce the in-class delivery of topics and main emphasis was on consolidating and embedding focal learning material necessary for content delivery in the SNS as well as supporting assessment. Each weekly activity was delivered according to the schemes of work that had been planned for the teaching of the module. Weekly activities started with the tutor's instruction to handling the exercises, clear introduction to the topic being delivered and also the type of activity at hand. At the end of each activity learners were asked to complete a poll indicating their preference based on the scores given for the completed tasks. Results of the activities were assessed based on the comments and replies provided by the learners. Each individual learner was given scores based on the accuracy of the answers and efforts made in completing the exercises.

The first and second pilot study with HEI students involved more than 80 students from a first year undergraduate module in Business Information Systems. Participants' responses were collected through each individual's completion of the online survey and questionnaire submitted through the university Virtual Learning Environment (VLE). The questionnaire was designed to capture responses of participants' study of the social network representing other educational establishments namely Facebook pages of 10-12 other universities. Each participating group developed their own Facebook page and provided peer-evaluation to other student groups by completing a template with sections relating to strategy, operation, development, testing, evaluation and deployment of SNS. Participants' responses were focused on how each participating group in the study would integrate use of Web 2.0 in their Facebook page. The peer-evaluation section consisted of three parts focusing on goal-based evaluation, goal-free evaluation and criteria based evaluation. In the goal based evaluation section participants were asked to identify three specific and measurable goals for evaluating their Facebook pages in terms of user learning effectiveness. In the goal free evaluation section participants created a Likert scale poll based on the user learning operations. The criteria based evaluation asked participants to identify specific criteria you can use to measure and assess the effectiveness of the Facebook page in terms of: (i) Performance (focusing on the Facebook features available to the users) (ii) Functionality (focusing on the functions users can perform on the page), (iii) Usability (focusing on the page's look, feel and ease of use) and (iv) Sociability (focusing on creating and sustaining interactive user groups).

### 3.2 Data Collection

For the FEI students, the first weekly activity consisted of checking learners' prior knowledge and familiarization with the theoretical concepts followed by practical exercises to complete a Spreadsheet model. "Use of spreadsheet models in business" was the topic that learners had the opportunity to reflect on their prior knowledge and exchange their ideas through comment feature of Facebook. Each learner was able to read and comment on other learner's comments and also respond to other's questions or ideas. The completion of the practical exercise was an opportunity for the group to comment on how to use the formula and built in functions in the scenario design. Students were able to comment on the functions and formulas they could use and exchange of ideas were flowing between all members of this group. The second weekly FB activity was designed to explore students' understanding of their own stages of the software development lifecycle (SDLC). Students were poked to participate in an activity around a SDLC diagram that was uploaded, including questions that should be answered, invited comments, uploads of images, videos and documents. This activity attracted learners more, probably due to its visual and graphical representation of the SDLC concepts. Learners were able to respond better to each stage and recognise the stages and then identify the stage they were working on. Students were poked to share their ideas by uploading of images, photos and videos. The third weekly Facebook activity was designed to recap the use of different advanced functions and formulae by way of presenting the learners with the videos of the most useful features of the software. Students were poked to watch online video tutorials through Facebook activity and practice using the feature they have watched on their own practical assignment. The videos were aimed at different levels of learners from basic to more advanced features of the software. This activity was designed to recap student's basic understanding and skills of how to use functions and formulas to complement the design of their spreadsheet model. Learners were poked to share their views and the topics they have learnt through comments and photos. The fourth weekly Facebook activity was designed to enable students to relate the learnt classroom concepts to the design and implementation of their model. Learners were poked to comment on an incomplete design of a model and share their ideas on how to improve the model through the use of comments and images of their own design. Students were asked to upload their own design and comment on the storyboard of each worksheet and workbooks created individually as well as identifying the use of the functions on each worksheet design that enabled the creation of the model. Students were poked to share and view other individual's uploads of images and comments. The final week of Facebook activities was designed to recap and summarise the learning and practical concepts of the module. Learners were poked to share and comment what they have learnt and summarise the concepts and also comment on each other's views and understanding of the topics.

On the other hand, HEI students participated in a Facebook activity that required the development of Facebook-based SNS in groups and then the evaluation of the created pages individually. The development report and the evaluation surveys consisted of sections on strategy, operations, deployment plan, testing, and evaluation. In the strategy sections participants studied the social network pages to provide their understanding of the goals and objectives of other universities with directions on enhancement of user learning. In the operation section of the questionnaire, participants studied other university Facebook pages and ranked these pages according to the learning opportunities offered to the online users. In the development plan section participants were asked to record the features of other universities Facebook pages focusing on certain features of Facebook. In the testing section of the questionnaire participants were asked to respond to a testing log with three parts: describe the testing feature, reflect on the feature and test the feature. In the evaluation section of the questionnaire participants were asked to complete questions on evaluation of the 10 university Facebook pages. The evaluation plan of the questionnaire consisted of three parts. Goal based evaluation to provide rating on other university Facebook pages of user learning operations. Goal free evaluation section of the evaluation log required participants response to 10 key questions in relation to the 10 university Facebook pages. The last part of the evaluation log consisted of participant's response to four key questions in relation to the 10 'university' Facebook pages. The deployment plan of the questionnaire gathered data through their response to identify 5 common ways that the 10 university Facebook pages utilise the Facebook features.

### 3.3 Observations

The FEI pilot study provided some interesting findings from early observations. It appears that most learners particularly those with specific cognitive deficiencies experience higher level of difficulties during an activity that would require their efficient processing skills. The Facebook learning activities should be created with an adequate level of intuition and challenge for the average learner but also with delicate attention to the learning cues to provide those learners with mild cognitive difficulties to absorb the cues and process the instructions with more time frames for completion.

The second weekly activity emphasised the benefit and importance of using graphical images and diagrams when delivering learning activities. Most participants were drawn to the presentation feature of this activity and the use of colours and a diagram seemed to absorb student's attention even when the groups started to browse the page to become familiar with its content.

The third weekly activity needed the use of earphones by learners. It became clear that many learners expected the content of the tutorials to represent the exact topic that they were trying to learn by attempting the activity. This means that use of long trailers at the start of the tutorials to even relate to the subject should be avoided. Many learners found it frustrating to watch a video in anticipation of learning about the exact features of the software. Video tutorial lengths should be kept to the minimum requirement with clear content list and introduction of the topics.

The fourth week activity enabled students to take charge of their own learning and reflect on their own work. Learners were required to suggest improvements on an incomplete design and implementation of the spreadsheet model. Students compared their own project with the given prototype and reflected on what they had learnt and made suggestions by posting photos, diagram and text. Many found this very useful and the activity generated a flow of comments and feedbacks.

The final week of the activities meant that students were summarising their understanding of the topics by posting sentences, text, images, photos, videos, etc. Many chose to post text comments and show qualitative expression of what they had learnt. This activity should have been more carefully questioned in groupings of comments or directing the learners just to use the certain type of post. The question should have asked for the exact nature of the reply expected rather than a general summary.

## 4. QUANTIFYING STUDENT PERFORMANCE

In an effort to provide some quantifiable means for assessing student performance when using the Facebook SNS the authors attempted some statistical analysis of usage data in association to student performance in specific activities as well as their responses to the templates used for peer evaluation and group activities. This section describes work in progress that aims to provide a set of guidelines for using appropriate statistical methods in quantifying the impact of SNS in learning enhancement.

### Regression analysis

Initial analysis was based on using two variables, namely total marks (referring to grades provided for in-class learning activities) and activity points (referring to grades provided for Facebook activities), use of descriptive statistics was used as in the following table. Data related to the participants' online activity scores that represented their participation with Facebook activities and also data related to the module scores in the classroom were used in the regression analysis. The linear regression factor of 0.526 indicated a positive correlation between students' efforts on completing Facebook activities and students' classroom based activities and achievement in the same modules. This was somehow expected as better students were more active on Facebook as well.

Table 1. Summary regression analysis

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.725 <sup>a</sup>	.526	.498	5.428	.526	18.830	1	17	.000

a. Predictors: (Constant), Points from activity

The summary regression analysis corresponds with the linear regression graph that indicates the value of R squared to be 0.526 which is a positive and acceptable result indicating the correlation between the two variables of students total marks and Facebook activity scores. The result is positive although not very strong, it can be concluded that many other factors (necessitating further study) contribute to the strength of the R squared value.

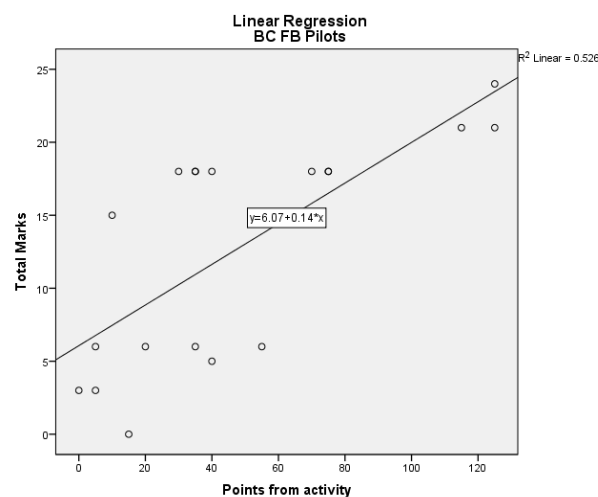


Figure 1. Regression graph

#### Matrix Scattered Boxplot

The same data set from the evaluation questionnaire was used for analysing responses from 40 HEI learners, using the matrix scattered plot to compare each evaluation question and identify its relation to other attributes of group Facebook pages. The matrix scattered plot reveals patterns of similarity for reading posts and liking posts, writing comments and joining events. Other patterns were identified with Facebook pages followed and photos and videos watched. There was not a positive relation between number of days waited in relation to any other question or attribute of Facebook pages. In other words the delay in responding to Facebook comments did not affect any other features of the group pages. As in following graph, using boxplot to represent the data in the goal free evaluation of 40 individuals, it was revealed that "questions asked" had no relation to other factors on Facebook pages, representing the lowest scores on the group's pages collected. Similarly "Polls voted for" scored low and did not show a relation or effect from other Facebook features. There were similarities between "photos viewed" and "posts liked" and some relation also between these two variables existed with "posts read" on Facebook pages. It seems that there is an association between the number of photos viewed and the number of likes from the same users. This tends to be a pattern with more active Facebook users in both groups. "Comments wrote" and "videos watched" also were on the lower scale of values compared with "reading and liking posts" and "viewing photos". "Joining events" was not a very strong factor in all the Facebook groups and all participants' data revealed a minimum score. There generally was not strong consistency in how the group pages were rated, however there existed a



strong link between “viewing photos” and “liking the posts/ photos” and then “ reading the posts.” In other words our study cannot provide conclusive evidence for association between Facebook features apart from the three mentioned above. It appears that patterns of Facebook use for educational purposes would emerge only for the number of photos viewed and liked leading to further reads.

The authors will direct future work towards this finding, trying to proof specific patterns between these three activities, as it could lead into a strategy for guiding student attention towards selected content and triggering reading of certain posts on Facebook pages or SNS in general.

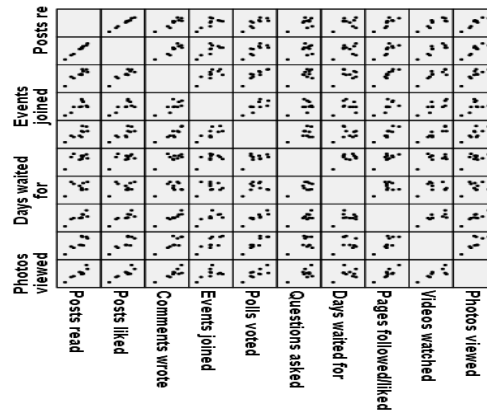


Figure 2. Matrix Scattered Boxplot

#### Bivariate (Pearson) Correlation (HEI factors)

Finally, analysing the survey responses from the goal free evaluation focused on how participants rated performance in Facebook group activities. Each survey question was identified as a variable, and Pearson Correlation factors were generated across all variables. As shown in the table, all variables (factors) have a positive Pearson Correlation of more than 0.9 indicating that all participants scored high in their goal free evaluation survey and also each factor is in a positive correlation with other factors. The findings here are consistent with the data analysis and findings of participants’ online behaviour during completion of Facebook activities in the pilot studies conducted at the FE College. While there was a generally strong correlation between all variables (factors), one or two factors were more in correlation with each other. For example strong correlation existed between (there was some correlation between number of posts read and number of posts liked):

- Number of posts liked and number of events joined
- Number of pages followed and number of comments written
- Number of questions asked and number of events joined
- Number of videos watched and number of polls voted for

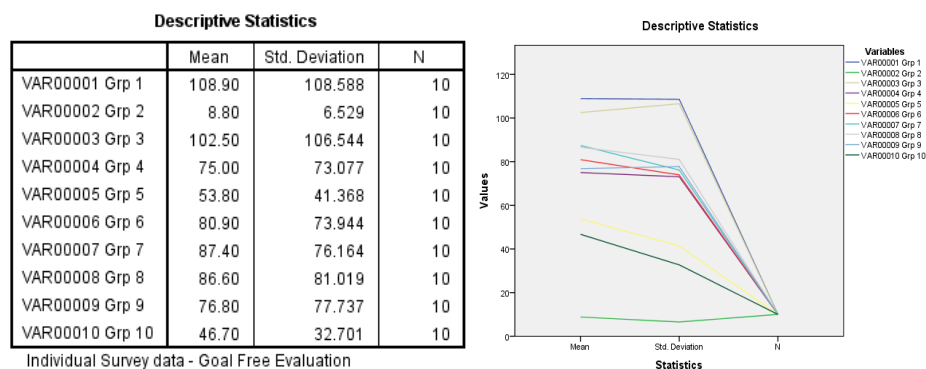


Figure 3. Descriptive statistics

The five dimensions of the e-moderation model serve as a reference point for the above analysis. The dimensions that are primarily supported by our findings include (i) access and motivation (through the contribution to Facebook pages), (ii) online socialization (through direct interaction between participants), and (iii) information exchange (through discussions between students and instructors). Further work is required to provide a direct association of SNS interactions and the remaining two dimensions, namely (i) knowledge construction and (ii) development. The study had access to both FEI and HEI students in the same discipline. The scope of including both was to investigate whether different patterns would emerge. The research hypothesis did not differentiate towards the two cohorts, as this was not the scope of the research. The emphasis of this paper was on the FEI student results.

## 5. CONCLUSION

The integration of Salmon's e-moderation model with the authors' investigation in Facebook activities and the role of SNS in education yielded some general positive outcomes. A broader acceptance of Facebook as a formal learning media necessitates configuration of the social learning environments and experimented controls over the required outcomes of each learning session. Further studies on full integration of Facebook as a formal learning environment will need to focus on evaluation of learning styles according to the subject area and examination of social boundaries and ties within which the deliverables are aimed at. The result of statistical analysis revealed that students' grades were positively influenced with the complementary use of Facebook on their courses of study. Using Facebook alongside delivery of courses expanded user participation as more students joined university events and asked questions when they enjoyed reading and liked a post.

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